Surface Water & Ocean Topography (SWOT) SLA

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Introduction

Purpose and Scope

This MGSS Service Level Agreement (SLA) document establishes agreements between the Surface Water & Ocean Topography (SWOT) mission and the Multimission Ground System and Services (MGSS) Program Office (930). MGSS is the program that manages the Advanced Multimission Operations System (AMMOS). This SLA document describes the AMMOS tools and services needed to support the Project.

Applicable Documents

Referenced Controlling Documents

1. NASA JPL MGSS Commitment Process, MGSS Document No: DOC-000011, 29 June 2011

Documents

For all referenced documents, refer to most current version.

1. NPR 7120.5, NASA Program and Project Management Processes and Requirements
2. JPL Information Technology Security Requirements, Rev.14, JPL Rules DocID 36852
3. AMMOS Level 3 Functional Requirements, MGSS-DOC-0001, Rev. B (DOORS Baseline 3.0)
4. MGSS Program Software Management Plan, DOC-0004
5. MDAS Software Management Plan, DOC-0175
6. Mission Planning and Sequencing (MPS) Subsystem Software Management Plan (SMP), DOC-0178
7. Mission Planning and Sequencing Team (MPST) Software Management Plan, DOC-0020
8. MITD Software Management Plan, DOC-0185
9. MGSS Navigation and Mission Design Software Management Plan, DOC-0200
10. MGSS Instrument Operations Subsystem Software and Infrastructure Management Plan, DOC-0046
11. Relay Operations Plan, v3, DOC-0453, JPL D-26272
12. All the AMMOS Level 4 Functional Requirements Documents
13. IT Security Database Plan 623
14. AMMOS Platform Description Document, MGSS-DOC-000871

Funding Agreement for AMMOS Adaptation and Support Services

The funding agreements are captured through the JPL institutional Work Agreement (WA) mechanism. Using the WA process, specific implementations of the AMMOS are negotiated. Each WA is expected to have a responsible Cost Account Manager (CAM). In addition, each WA should include an associated staffing profile along with the total cost for the phase specified. Also a schedule should be included which reflects work products and services for the specified phase. WA's can be accessed online at https://wa.jpl.nasa.gov/. The online version is the preferred version because it is the most current version at any given time.

Surface Water & Ocean Topography (SWOT) Overview

The Surface Water & Ocean Topography (SWOT) satellite mission with its wide-swath altimetry technology is a means of completely covering the world's oceans and freshwater bodies with repeated high-resolution elevation measurements. SWOT is a truly multi-disciplinary cooperative international effort. The SWOT mission brings together two communities focused on a better understanding of the world's oceans and its terrestrial surface waters. U.S. and French oceanographers and hydrologists and international partners have joined forces to develop this new space mission to make the first global survey of Earth's surface water, observe the fine details of the ocean's surface topography, and measure how water bodies change over time. SWOT will have a mission lifetime of 3 years.

The science goals of SWOT are:

- Provide sea surface heights (SSH) and terrestrial water heights over a 120 km wide swath with a +/-10 km gap at the nadir track.
- Over the deep oceans, provide SSH within each swath with a posting every 2 km x 2 km, and a precision not to exceed 0.8 cm when averaged over the area.
- Over land, download the raw data for ground processing and produce a water mask able to resolve 100 meter wide rivers and lakes of 250 meter2 in size, wetlands, or reservoirs. Associated with this mask will be water level elevations with an accuracy of 10 cm and a slope accuracy of 1 cm/1 km.
- Cover at least 90 percent of the globe. Gaps are not to exceed 10 percent of Earth's surface.

Program and Project Management

Table 1. Project Team Members

Andy Dowen	MGSS Program Manager
Eleanor Basilio	MGSS Mission Interface Manager
Sherry Stukes	MGSS Mission Interface Engineer

Schedule Overview

Table 2. Milestones

2020	Planned Launch

General Agreement

Responsibilities

Mission Responsibilities

1. MGSS will provide to the Project a set of multimission services and tools, as described in this document.
2. the Project will provide funding if mission-unique enhancements to any multimission AMMOS tools are required.
3. the Project will provide information pertaining to itself, the ground segment, and spacecraft information to MGSS to enable implementation of baseline AMMOS tools and services and to enable project-specific adaptations. the Project will negotiate with MGSS for the delivery dates of that information.
4. the Project will be responsible for adapting, integrating and testing the project-specific elements into the MGSS elements delivered above.
5. the Project will be responsible for ensuring the deployed system complies with institutional security guidelines.
6. the Project is responsible for converting the Project specific tools and scripts to operate on the Linux environment. The Project may fund MGSS to perform this conversion as necessary.

MGSS Responsibilities

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Shared Responsibilities

1. the Project and MGSS will coordinate integration, test and deployment plans in order to be efficient and avoid unnecessary duplication of effort.
2. the Project and MGSS will perform adaptation of multimission tools. This choice of having MGSS manage the adaptation or the Project manage the adaptation can be made subsystem-by-subsystem. MGSS will continue to have an independent level of oversight no matter which option the Project chooses.
3. The project and MGSS will work together to ensure the Project deployment environment (e.g., computing platforms) are in line with the MGSS reference operating environment.

Licenses

All AMMOS tools and services offered in this SLA are for Project specific use only. All AMMOS tools offered are subject to a nonexclusive, non-transferable, royalty-free license. Details on the specific license are available upon request.

Tools/Services Provided by AMMOS

This section lists the AMMOS tools and services provided to the NEA Scout mission by the MGSS program office, to be integrated with the NEA Scout mission Ground System. For clarification, tools are the AMMOS core tools that must be adapted and delivered to the NEA Scout mission. The cost of the adaptation is paid for by the NEA Scout mission, however, all bugs, fixes, maintenance and sustaining of the AMMOS multimission core tools are to be paid for by the MGSS Program at JPL. Bug fixes, maintenance and sustaining of the adaptation of the AMMOS is paid for by the NEA Scout mission. Integration, test and deployment into the NEA Scout mission GDS environment is funded by the NEA Scout mission. Following the initial release, changes to this document will be strictly controlled by the MGSS CM change process and will be approved by both the NEA Scout mission and MGSS.

Figure 1. AMMOS Comfort View
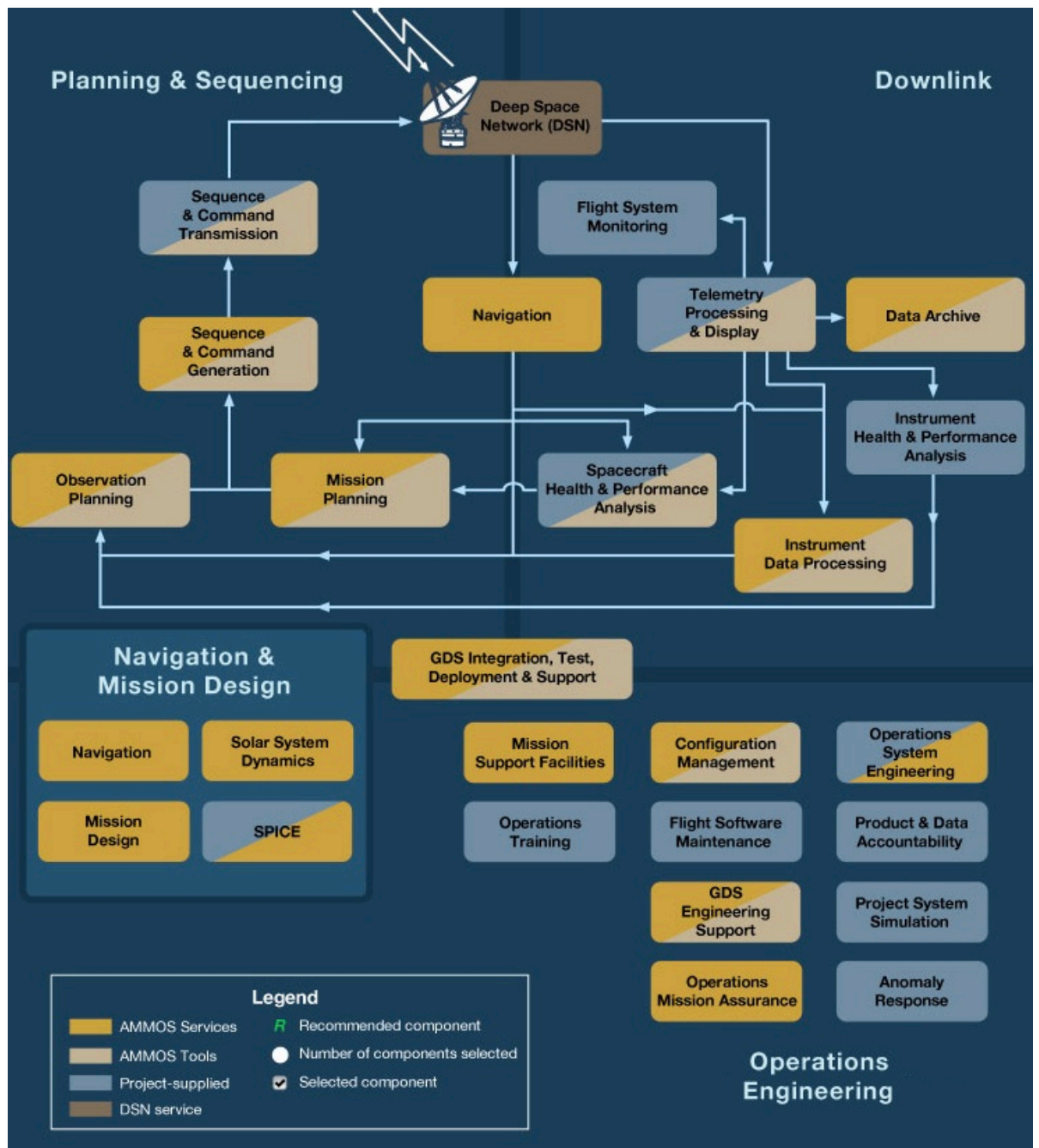
Downlink Service Descriptions

Downlink provides for capturing and distributing Flight System data, maintaining knowledge of Flight System performance and ensuring its continued health and safety.

Table 3. Tools/Services from Downlink

Tools/Services	Description	Project Need Date	Note
[SLA-1121] AMPCS (AMMOS Mission Data Processing and Control System)	**Telemetry Input Handling** • Processing of CCSDS-formatted spacecraft telemetry in packet format • Handling of DSN-generated SFDU wrappers • Reading of telemetry from a file, socket, DSN Emulator, DSN Telemetry Data System (TDS), or previously-created AMPCS database • Real-time notification and logging of status of connection to telemetry source **Telemetry Packet Handling** • Storage of packet data and metadata to database • Periodic real-time notification and logging of packet processing status • Packet gap analysis tool • Scrolling GUI and command line views of received packet statistics **Channel Processing** • Extraction of telemetry channel samples from real-time and recorded pre-channelized packets • Extraction of telemetry channel samples from packets using a decommutation map • Channelization of packet header/wrapper metadata • Channelization of DSN MON-0158 data • Derivation of new channel samples from existing ones using bit unpack or custom algorithms • Engineering Unit calculation using table, polynomial, or custom algorithm • Publication of channel samples on the real-time message service and archival of channel samples in the database • Tabular, Plot, and Custom Layout GUI views of channelized data • Scrolling command-line views of incoming channel samples • Telemetry channels and metadata storage (databases) [Note: Information about how to perform custom channel derivation is maintained in the AMPCS Users Guide. This document is maintained online here: https://jplwiki.jpl.nasa.gov:8443/display/AMPCS/User%27s+Guide ;		

Tools/Services	Description	Project Need Date	Note
	content specifically relating to algorithmic channel derivation may be found here: https://jplwiki.jpl.nasa.gov:8443/display/AMPCS/Algorithmic+Channel+Derivation https://jplwiki.jpl.nasa.gov:8443/display/AMPCS/Bit-Unpack+Channel+Derivation Additionally, AMPCS supports booleans, enumerations, up to order-8 polynomials, and interpolated (linear) table lookup.] **Alarm Processing** • Channel alarm computation for both real-time and recorded telemetry channels • Centralized calculation of high value, low value, inclusive range, exclusive range, mask, state, change, delta, digital, and combination alarm types. • Support for both project and user level alarm definition files • Publication of alarms on the real-time message service and archival of alarm events with channel samples in the database • Alarm GUI view **Session Handling** • Unique identification of each AMPCS session and all related data • Storage of all session configuration to the database • Single session output directory for all files in test venues • Migration of data between databases by session **Reporting** • Query for all basic types of data in the AMPCS database: sessions, packets, channel samples, log messages. • Selection from several standard report formats (CSV, summary, XML, etc) or user-defined format • Integrated session reports and data summary reports • Interactive plotting of channelized telemetry from the database **Automation Support** • MTAK (MPCS Test Automation Toolkit) python library • Automatic alarm notification via text or e-mail • Script triggering based upon real-time message service notifications • Concurrent migration of data from local to remote database • Fixed View perspective python library for writing scripts that generate displays		

Note: Decoding SLA numbers: INS-SLA-xyz#[1]

GDS Integration, Test, Deployment & Support Service Descriptions

Table 4. Tools/Services from GDS Integration, Test, Deployment and Support

Tools/Services	Description	Project Need Date	Note
[SLA-2122] Integrated GDS with DSNE (DSN Emulator)	Integrated and tested GDS delivery with DSNE. DSN will maintain and deliver the DSNE to MGSS. MGSS is responsible for integrating and testing the DSNE with the rest of the MGSS provided GDS and delivery to the project.		

Navigation and Mission Design Software Functional Descriptions

MGSS funds the development of multimission software that is used by JPL mission designers and navigators to maintain knowledge of Flight System position/velocity and plan its trajectory for future mission activities. Using tools developed with MGSS funding (and to a lesser degree, flight project funding), JPL mission designers and navigators are able to perform the functions described in the following table.

- x -- Activity (1. Downlink, 2. GDS Integration, Test, Deployment & Support, 3. Navigation and Mission Design, 4. Operations Engineering, 5. Uplink)
- y -- Function (see AMMOS Catalog, http://dm-web6.jpl.nasa.gov/devel/ammos_catalog/staging/toolsandservices/catalogindex/#tab-list)
- z -- Tool or Service (1: Service, 2. Tool) [note: Not applicable to Navigation and Mission Design]
- # -- SLA tool/service number

Table 5. Tools/Services from Navigation and Mission Design

Tools/Services	Description	Project Need Date	Note
[SLA-3111] Natural Body Ephemeris	Generation of up-to-date natural body ephemerides and their associated uncertainties, either generic solar system ephemerides or specific ephemeris improvements required by a particular mission.		
[SLA-3112] Gravity Modeling	Generation and provision of multimission gravity models for solar system bodies.		
[SLA-3411] SPICE Toolkit	The SPICE Toolkit (Spacecraft, Planet, Instrument, C-Matrix, Events) provides application programs and a subroutine library that read and write SPICE kernel files and calculate observation geometry quantities.		
[SLA-3412] SPICE Data/Kernels	Provision of generic reference data sets containing ancillary navigation data that may be accessed or manipulated via the SPICE Toolkit. Three separate sets of ephemerides are provided: planetary bodies, natural satellites, and small bodies (e.g., comets and asteroids). Data sets containing planetary constants and leap seconds are similarly provided.		
[SLA-3413] NAIF Data Processing	Production of SPICE files, either generic data or mission specific data. Provision of reduced and interpreted ancillary datasets to space scientists pertaining to their experiments.		

Operations Engineering Service Descriptions

Operations Engineering provides cross-cutting and support functions necessary to operate and sustain a Mission Operations System.

Table 6. Tools/Services from Operations Engineering

Tools/Services	Description	Project Need Date	Note
[SLA-4311] Duty Roster	The Duty Roster is a web based notification system that allows a customer (mission/service provider) to tailor functional roles that map to their organization structure, and enable teams and individual members to be responsible for their status. By mapping to an organization structure, distinct groups can be defined. Groups can be a collection of roles, resources or other groups. The entire duty roster is laid out so that a user can quickly view role and contact information they need. Additionally, it provides search capability to expedite finding individuals assigned to specific roles. Notifications can be sent to a customizable list of active roles and individuals. The system incorporates a calendar capability that provides a history of status changes and allows for scheduling future role availability. The Roster is available across a broad range of mobile devices.		
[SLA-4111] Network Connectivity	Provides network connectivity to the mission network for project workstations, servers, and printers. The mission network is high-availability and secure. Network connection		

Tools/Services	Description	Project Need Date	Note
	options are 10/100/1000 Mbps with fault detection and correction. Network time service, domain name service, and perimeter access control are included.		
[SLA-4112] Remote Partner Site Network Connectivity	Provides network connectivity to the mission network for remote project locations. Includes wide area network connections, as required, and the above Network Connectivity capabilities and services. Secure wide area network connections are also available.		
[SLA-4113] Operational Voice Service (VOCA) (Voice Operational Communications Assembly)	Provides real-time, multi-channel, shout-down voice communications between project elements. Includes voice instruments and custom voice net set up. Service is high-availability and includes fault detection and correction.		
[SLA-4115] Common Access Manager (CAM)	The Common Access Manager (CAM) provides application layer access control capabilities. MGSS manages and operates the CAM Server that is used by the DSN (Deep Space Network) Command Preparation&Delivery (CPD) subsystem. CPD users will be authenticated by using a CAM login page before they are able to use CPD. CPD will use the CAM to verify that users have been authenticated and that they are authorized to use CPD services. MGSS manages the authorization policies that are enforced by the CAM used by the DSN. The DSN will coordinate CPD authorization policies with Project, and provide authorization policy statements to MGSS for implementation in the CAM. MGSS will support the DSN in the design of authorization policies to ensure that policies are properly defined.		
[SLA-4210] Configuration Management Service	The configuration management (CM) service provides change control management for flight and ground software. The CM service provides trained CM engineers and includes source code management, software build engineering, software environment configuration, change control, and release engineering. The CM Services provide an archive repository for mission released software, that is maintained locally as well as providing scheduled off-site backups. The CM service has been developed around industry standards and frameworks allowing for traceability, repeatability and accountability throughout a project's entire lifecycle. The CM service includes the web based OIA tools.		

Uplink Service Descriptions

Uplink functions are responsible for the generation of mission plans, science observation plans, sequence and command generation for NASA flight projects. The products of these uplink functions are used to communicate with and control the spacecraft. Spacecraft operability constraints, mission rules, and flight rules are enforced, and spacecraft activities, science activities, and instrument activities are merged during

the planning and sequencing process to produce integrated, conflict-free command products to control the spacecraft.

Table 7. Tools/Services from Uplink

Tools/Services	Description	Project Need Date	Note
[SLA-5124] AMPCS Uplink	Provides a user interface for building spacecraft commands, controlling the uplink of commands and command files, and archiving command logs primarily in the spacecraft test environment.		
[SLA-5121] SLINC/CTS (S/C Language Interpreter, Collector&Command Translation)	Spacecraft Language Interpreter and Collector (SLINC), Command Translation Subsystem (CTS) translate sequence commands from command mnemonics to binary. (CFDP binary file can also be produced.)		
[SLA-5123] ASP	Provide the Automated Sequence Processor (ASP) capability to perform automatic generation of sequences and command products. Includes adaptation, implementation, and maintenance of the software, as well as training of the operations team in the use of the ASP system.		
[SLA-5127] MPS Editor (Mission Planning and Sequencing Editor)	Mission Planning and Sequencing Editor (MPS) enables the creation and editing of sequences and the capability to ingest, merge, and output sequences in a variety of formats (e.g. SATF, SASF, VML, RML). Enables modeling of blocks, sequences and commands via the invocation of SEQGEN. Includes a drag-n-drop GUI to assemble blocks and sequences.		
[SLA-5129] SEQGEN (Sequence Generation)	Expand a series of science and engineering activities into their resultant spacecraft commands, model changes in spacecraft state based on commands in order to produce event predictions, model sequences expanded onboard the spacecraft and those expanded on the ground, and indicate conflicts in the modeling of commands and violations of flight rules.		

Services Not Selected

This section lists AMMOS capabilities that have NOT been selected for this mission.

Downlink Capabilities Not Selected

Table 8. Tools/Services Not Selected

Tools/Services	Description
[SLA-1211] Multimission Data Management Team	DMT provides a multimission service that supports long-term data archive and associated engineering support for the mission operations environment.
[SLA-1221] Archive and Catalog of Mission Engineering Data	Provides for mission engineering data archive and catalog. DOM provides the capability for a catalog of mission files (primarily uplink), based on project-unique schema. AMPCS provides the capability for a catalog of mission data (Packets and Channels). Multimission Data Management Team (DMT) provides engineering support in this area.
[SLA-1321] Time Correlation	Time Correlation provides software for performing SCLK (Spacecraft Clock) to SCET (Spacecraft Event Time) correlation and engineering support to predict spacecraft clock drift.
[SLA-1322] Telecom Prediction and Trending Analysis	Telecom Analysis provides a suite of tools to support telecom prediction and analysis. The TFP toolkit includes support for various environments and deployments, as well as a Web-based service.
[SLA-1323] RAMPAGE (Remote Access Multi-Mission Processing and Analysis Ground Environment)	RAMPAGE (Remote Access Multi-Mission Processing and Analysis Ground Environment) provides data access to mission engineering data from a standard web browser. RAMPAGE is distributed as a server-side application that has been adapted to meet the needs of remote users.
[SLA-1414] Instrument Product Access/Delivery Service	Provides delivery of instrument products to remote sites. Tracks, delivers, and provides accountability information about delivered products and provides access to Level-0 products (EDRs) (Experiment Data Record) and Level-1 or higher products (RDRs) (Reduced Data Record).
[SLA-1415] Science Data Infrastructure Service	Science Data Infrastructure Service provides the following services: a) Monitors system processes and performance. b) Provides a long-term repository for system / project programs and files. c) Provides hosting capability for project applications servers. d) Provides data facility support, including system administration, monitoring of system processes and performance and notification. e) Performs system maintenance activities, such as routine backups, user accounts, installation of Third Party Software. f) Performs analysis of requirements and provides design of hardware system to meet user requirements. g) Provide hardcopy services, such as custom image processing hardcopy (e.g., color corrected mosaics or combinations of multi-instrument data sets to provide photo-quality prints, including large scale format) and hardcopy visualizations or models (e.g., stereo lithography).
[SLA-1421] Automated Task Invocation Tool	Automated, multimission instrument task invocation tool (MATIS), adapted for the customer, creates project-specific classes that facilitate automation of instrument data product generation or any systematic sequential processing (e.g., pipeline processing, workflow manager) [Note: IOS does not provide tool adaptation unless the project requests and funds the tool adaptation.]

Tools/Services	Description
[SLA-1422] Image Format Translation Tool	Tool to translate from one image data format to another, while preserving meta-data content. [Note: IOS does not provide tool adaptation unless the project requests and funds the tool adaptation.]
[SLA-1423] Image Processing Toolkit	The Image Processing Toolkit provides an integrated image processing program set, libraries, and a standardized interface. This tool set includes programs for image registration, image display, data conversion routines, pixel plots or listings, label processing and/or display, contrast enhancement, text and graphic overlays, color reconstruction, digital filters, fast Fourier transforms, image blemish removal, image orientation, geometric transformations, map projections, and radiometric calibration. [Note: IOS does not provide tool adaptation unless the project requests and funds the tool adaptation.]
[SLA-1424] Image/ Experiment Data Record Display Toolkit	The Image/Experiment Data Record Display Toolkit provides for display of image files in a variety of image formats: • JEDI (Java EDR (Experimental Data Record) Display Interface): Provides a JAVA-based near real-time image display capability • Xvd: Provides an X-windows, motif based Image Viewer that displays large images • JADE: Provides a high performance image viewer with rapid display of large images (gigabytes), including overlays, stereo display(anaglyph, color glyph, and Java 3D), pan, and zoom features • Marsviewer: Provides a rich-client display tool for browsing and viewing image data products and visualizing their content • Webification: Provides a ReSTful web service (w10n) framework that facilitates direct, browser-based access to instrument data products and applications from any location
[SLA-1425] Tactical Product Generation Toolkit	Enables production of tactical instrument data products (e.g., primarily for lander or rover projects, but can be used for orbiters). [Note: IOS does not provide tool adaptation unless the project requests and funds the tool adaptation.]
[SLA-1426] Instrument Product Access/Delivery Tool	Automated, secure data delivery and integrity validation by subscription (e.g. type, mission, time, filename) within seconds of generation. [Note: IOS does not provide tool adaptation unless the project requests and funds the tool adaptation.]
[SLA-1427] APPS (AMMOS-PDS Pipeline Service) (PDS: Planetary Data System)	APPS is a software suite that enables creation and validation of PDS4 labels and archive bundles by science data producers. It includes a distributed processing system that can attach to the operational data pipeline and produce archive ready products on the fly. Label Design Tool (LDT) - The LDT is a standalone APPS component that enables creation of PDS4 product labels.

GDS Integration, Test, Deployment & Support Capabilities Not Selected

Table 9. Tools/Services Not Selected

Tools/Services	Description
[SLA-2114] Integrated Linux GDS process and procedures	Provides proven multimission processes and procedures, including GDS planning, coordination, delivery reviews, Integration&Test, Test Readiness Reviews and Mission Change Requests (MCR) generation. Provides fully functional, integrated and tested AMMOS Ground Data System software.
[SLA-2115] Multimission GDS Testbed Facility	The facilities are available for a multimission test-bed. Included are: clean power, availability of ports, chairs, location. Not included is the hardware or virtual machines that would be used and paid for by the project as well as the network port connections.
[SLA-2126] ADS (Auto Deployment System)	ADS (Automated Deployment System) enables users (e.g. Configuration Management) to deploy and audit ground system software.

Navigation and Mission Design Capabilities Not Selected

Table 10. Tools/Services Not Selected

Tools/Services	Description
[SLA-3211] Preliminary Mission Design	Discovery of trajectories that fulfill the mission needs, including any combination of maneuvers, gravity assists, low-thrust segments, aero-assist segments, and low-energy transfers in support of pre-Phase-A and Phase-A studies. Determination of launch and arrival date ranges. Preliminary design of operational orbits.
[SLA-3212] Mission Design and Trajectory Optimization	Refinement and optimization of trajectories that fulfill the mission requirements, including any combination of maneuvers, gravity assists, low-thrust segments, aero-assist segments, and low energy transfers. Refinement of launch and arrival date ranges. Detailed design of operational orbits. Analysis of delta-V budgets. Analysis and re-optimization of trajectories after a mission event that requires a replanning of the mission.
[SLA-3213] Launch Trajectory and Vehicle Performance Analysis	Optimization of launch vehicle targets to increase the range of launch opportunities or to improve margins.
[SLA-3214] Vehicle Break-up Analysis	Analysis of vehicle break-up scenarios on nominal and contingency launches, entries, or re-entries. Assessment of probabilities and risk of ground impact for spacecraft components.
[SLA-3311] Navigation Analysis and Design	Analysis and design of the navigation subsystem, including optimization of tracking data types and tracking schedules, orbit determination strategy, prediction, delivery and reconstruction accuracy analysis and planetary protection analysis. Generation of the Navigation Plan.
[SLA-3312] Launch, Acquisition and Early Orbit Determination	Generation of trajectory predicts in support of all possible launch dates and times, launch accuracy assessment, orbit determination and prediction in support of second station acquisition.
[SLA-3314] Orbit Determination	Generation of accurate predicted and reconstructed trajectories using a combination of tracking data types. Generation of simulated trajectories and measurements for Operational Readiness Tests and other analysis.

Tools/Services	Description
[SLA-3315] Trajectory Analysis and Maneuver Design	Analysis and re-optimization of trajectories and maneuvers that fulfill applicable mission requirements for different mission scenarios.
[SLA-3316] Real-time Event Monitoring	Real-time monitoring of tracking data residuals in support of rapid turnaround during mission critical events (e.g. maneuvers, orbit insertions, proximity operations).
[SLA-3317] Optical Navigation	Analysis of optical navigation requirements and camera design. Determination of image parameters, pointing, and imaging schedules. Conversion of images into navigation observables. Determination of small-body surface models and dynamic characteristics based on optical images. May include utilization of the positions of landmarks on a body surface in the navigation process (i.e., landmark tracking).
[SLA-3318] Entry, Descent, and Landing Analysis and Design	Analysis and design of atmospheric entry, descent and landing (EDL). Analysis and optimization of entry parameters and descent profiles. Evaluation of landing accuracy, landing hazards, and success probability. Monte Carlo analysis of EDL trajectories.

Operations Engineering Capabilities Not Selected

Table 11. Tools/Services Not Selected

Tools/Services	Description
[SLA-2113] AMMOS GDS Site Rep	AMMOS GDS Site Representative works closely with Project GDSE, attends Project GDS Design Team meetings, Anomaly investigations. Provides and coordinates the AMMOS response to the project.
[SLA-4312] MGSS Web Services (MWS)	Provides a web hosting service for internal (not publically available) websites to support activities with the local and remote science team members, mission operations reporting, and mission developed and operated utilities. The MWS system is fully redundant with load balancing and system failover to ensure that customer zones (virtual machines) are available at all times and system recovery is transparent to the user. Each user is provided with a development zone, redundant test-bed zones, and redundant operational zones. Each zone includes memory, storage CPU assignment. Service includes 24x7 phone, online, and automated customer support. Onsite support is available during normal business hours (Pacific Time Zone). This service is under assessment and will be finalized by CDR.
[SLA-4313] MMOLMWEB (Web Services Provided by JPL at LMSS)	Provides a web server for missions supported by LMSS (Lockheed Martin Space Systems), using MGSS hardware located at their facility in Denver, CO. Typical support starts in Phase C and continues through mission closeout. Mission customers use this resource for logging information, reporting, and making available mission specific databases, such as command and telemetry dictionaries. Each customer is allocated zones (virtual machines) that match their specific needs. MMOLMWEB (Web Services Provided by JPL at LMSS) system and service documentation is provided via a wiki.
[SLA-4314] Multimission MSA	MGSS will provide a shared Multimission Mission Support Area (MSA) facility, and the engineering planning and coordination for the installation and removal of project-specific equipment and support leading to and during mission-critical events.

Currently located on the second floor of building 264, the MSA can accommodate up to 12 operational positions. This facility includes secure badge reader access, raised floors allowing for computer cables, multi-station video projection, storage cabinets, ergonomic chairs, white board and a small conference table. This MSA is equipped with access to VOCA (Voice Operational Communications Assembly) ports, network |

Tools/Services	Description
	ports for workstations, clean power, mission clock, teleconference equipment, and printers. This MSA allows for JPL TV Audio-Visual team access, including camera mounts. It is the responsibility of the Projects to lease or purchase the project-specific computing equipment (specifically, keyboard, displays, and servers) which will be located in the MSA. Projects are also responsible to pay the shared cost of the VOCA and network ports.
[SLA-4114] Security Service	Provide IT security on the mission net including perimeter access control, network based and host based security controls, security monitoring, auditing, and incidence response.
[SLA-4116] MGSS CCC Platform Infrastructure Service	MGSS CCC facilitates the procurement of Platform Infrastructure (including physical server, VM licenses, and local storage) from the OCIO that has been optimized to operate the AMMOS and has been qualified on the AMMOS System Testbed. The customer's cognizant system administrator will perform all installation and configuration required. All hardware failure, maintenance, and support issues will be the responsibility of the customer's cognizant system administrator, who will work directly with the vendor as per the conditions defined in the hardware support subscription. The term of this purchase is three years, during which the OCIO will maintain the tracking of the system to an assigned cognizant person's JPL asset database. OCIO cognizant person will be responsible for the compliance with the institution's annual hardware inventory and will work with the project to confirm the location of and scanning of the hardware. The project will determine the appropriate IT Security database and maintain all required security updates, patches, etc. At any time during the term of service, the customer may choose to return the system back to the OCIO. The OCIO reserves the right to re-allocate the returned system to another customer, but may not charge for the package again. At any time during the term of service, the customer may request the transfer of the system to another project. Transfers are subject to the bilateral approval of the customer and OCIO. At the end of the three-year term, the project may elect to keep the hardware but will be required to pay for additional maintenance and licensing subscriptions at the prevailing vendor pricing without any additional overhead.

Uplink Capabilities Not Selected

Table 12. Tools/Services Not Selected

Tools/Services	Description
[SLA-5116] 3D Animation/ Visualization Service	Integrated data visualization and 3D-HDTV-rendering services that incorporate navigation and ephemeris files, CAD (Computer Aided Design) models, and remotely sensed images to support visualization for strategic operations (1-day to 2-week turnaround time).
[SLA-5111] Sequencing Software, Model Development, and Operations Engineering	This Uplink function is a service that consists of sequence operations engineering, and multimission software adapted to project-specific models. The combination enables quick and reliable integration of sequence requests, validation of sequences against mission-specific constraints, and generation of required command products. As a starting foundation, the sequence operations engineering employs the multimission

Tools/Services	Description
	operations process designs and procedures that utilize the multimission tools, and implements project-specific processes and tools where necessary.
[SLA-5112] DSN Keyword File (DKF) Generation	A Deep Space Network (DSN) Keyword File (DKF) is the mechanism used to configure and operate the DSN in order to radiate commands and/or receive telemetry. The DKF Generation service produces a mission-specific DKF based upon negotiated allocations of DSN resources and spacecraft events. DKF is used during Mission Phase D and E.
[SLA-5113] Deep Space Network Scheduling	The Deep Space Network (DSN) Scheduling service coordinates and negotiates DSN resources to support project activities. It includes the generation of files to support sequence and DSN Keyword File (DKF) generation processes.Deep Space Network Scheduling is used during Mission Phase D and E.
[SLA-5114] Mars Relay Planning	The Mars Relay enables an asset orbiting Mars to return data to Earth on behalf of a landed asset and enables data from Earth to be forwarded to a landed asset via an orbiting asset.
[SLA-5115] Mission Planning&Sequence Team	Provide trained personnel to perform planning and sequencing services for the flight operations of a variety of mission types. Service extends from mission and activity planning through sequence and real-time command generation and verification. Includes development of team functional requirements, operational interfaces, training, and validation of the operational team.
[SLA-5122] VML (On-Board Sequence Engine System)	The Virtual Machine Language (VML) system consists of several components that provide a standard implementation of a sequence engine. In addition to enabling activities to occur at specified absolute or relative times, the VML system provides the ability to create time-tagged instructions capable of invoking functions. The VML system simulates a generic processor, memory locations, and registers (i.e. the basics of any computing environment). In order to exercise the system, a user creates instructions as text using a sequence editor. The instructions are then translated into a binary format. The resulting binary can be used by execution tools such as the VML Flight Component (VMLFC) and Offline VM (OLVM) running on the spacecraft or in a software test lab.
[SLA-5125] RSFOS (Re-Engineered Space Flight Operations Schedules)	Graphical timeline of sequences and DSN activities.
[SLA-5126] USG (Uplink Process Tracking and Automation)	USG provides software for tracking products in the uplink process, including mission sequences and spacecraft commands, and supporting automation of mission operations via triggers and reports.
[SLA-5128] APGEN (Activity Plan Generator)	Enables mission and science planners to perform resource-driven planning that spans the range of high-level mission scenarios to detailed science activity plans. Constraints can be modeled and a graphical timeline enables violations to be easily identified. Can be used to create sequences, and those sequences can be validated using other MPS tools (i.e. SEQGEN).